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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/834,668	04/13/2001	Kameran Azadet	13-5	5633

7590 03/17/2004

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EXAMINER	
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ART UNIT	PAPER NUMBER
2133	5

DATE MAILED: 03/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/834,668	AZADET ET AL.
	Examiner	Art Unit
	Joseph D. Torres	2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) *19-36,39 and 40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-15,17,18,37 and 38* is/are rejected.

7)☒ Claim(s) *8,9,15 and 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 August 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4*.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *5* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-18, 37 and 38, drawn to A Method for Processing a Signal by Precomputing Intersymbol Interference Estimates based on Speculative Partial Intersymbol Interference Estimates and using the Precomputed Intersymbol Interference Estimates to compute Branch Metrics, classified in class 714, subclass 796.

   II. Claims 19-30 and 39, drawn to A Method for Processing a Signal by Precomputing Partial Intersymbol Interference Estimates based on Possible Values for a Data Symbol, Selecting Precomputed Partial Intersymbol Interference Estimates for Postcursor Taps other than the First Postcursor Tap and using the Precomputed Intersymbol Interference Estimates to compute Branch Metrics, classified in class 714, subclass 796.

   III. Claims 31-36 and 40, drawn to A Method for Processing a Signal by Precomputing Partial Intersymbol Interference Estimates based on Possible Values for a Data Symbol, Selecting Precomputed Partial Intersymbol Interference Estimates for Postcursor Taps and using the Precomputed Intersymbol Interference Estimates to compute Branch Metrics, classified in class 714, subclass 796.

The inventions are distinct, each from the other because of the following reasons: Inventions Group I, A Method for Processing a Signal by Precomputing Intersymbol Interference Estimates based on Speculative Partial Intersymbol Interference Estimates and using the Precomputed Intersymbol Interference Estimates to compute Branch Metrics, and Group II, A Method for Processing a Signal by Precomputing Partial Intersymbol Interference Estimates based on Possible Values for a Data Symbol, Selecting Precomputed Partial Intersymbol Interference Estimates for Postcursor Taps other than the First Postcursor Tap and using the Precomputed Intersymbol Interference Estimates to compute Branch Metrics, are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions provide mutually exclusive methods for computing branch metrics.

Inventions Group I, A Method for Processing a Signal by Precomputing Intersymbol Interference Estimates based on Speculative Partial Intersymbol Interference Estimates and using the Precomputed Intersymbol Interference Estimates to compute Branch Metrics, and Group III, A Method for Processing a Signal by Precomputing Partial Intersymbol Interference Estimates based on Possible Values for a Data Symbol, Selecting Precomputed Partial Intersymbol Interference Estimates for Postcursor Taps and using the Precomputed Intersymbol Interference Estimates to compute Branch

Metrics, are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions provide mutually exclusive methods for computing branch metrics.

Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group III, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for Group III is not required for Group I, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

During a telephone conversation with Kevin M. Mason on 12 March 2004 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-18, 37 and 38. Affirmation of this election must be made by applicant in replying to this Office action. Claims 19-36, 39 and 40 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: '630' in Figure 6; '820' & '840' in Figure 8; '1110', '1120', '1130' & '1140' in Figure 11; and '1210', '1220', '1230' & '1240' in Figure 12. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to because of handwriting in Figure 14. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The abstract of the disclosure is objected to because of punctuation in the second line of the abstract. Correction is required. See MPEP § 608.01(b).

Claim Objections

4. Claims 8 and 15 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 8 recites, "said method **allows** said reduced-state sequence estimation technique to be pipelined before or after each of said selections" [Emphasis Added]. Claim 8 fails to further limit claim 1 since it is not clear that the method actually uses any pipelining.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 8 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 8 recites, "said method **allows** said reduced-state sequence estimation technique to be pipelined before or after each of said selections" [Emphasis Added]. Claim 8 fails to further limit claim 1 since it is not clear that the method actually uses any pipelining, hence the claim is indefinite.

6. Claims 10, 11, 17 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 10 recites, "at least two-dimensional branch metrics". The language is incomprehensible since it is not clear whether "at least two-dimensional branch metrics" refers to -- at least one two-dimensional branch metric -- or -- at least two multi-dimensional branch metrics --. Note: claim 11 depends from claim 10, hence inherits the deficiencies of claim 10. Claim 17 recites similar language as in claim 10.

Claim 18 depends from claim 17, hence inherits the deficiencies of claim 18.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-8, 10-15, 17 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Mui; Shou Yee (US 6690739 B1; Note: the effective filing date is 14 January 2000).

35 U.S.C. 102(e) rejection of claims 1, 8, 10 and 11.

Mui teaches a method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of: precomputing intersymbol interference estimates based on a combination (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence; hence a single-sided template q(x,y) that accounts for postcursor ISI is a precomputed intersymbol interference estimate) of i. speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol,

and ii. a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state (col. 25, lines 35-60 in Mui teach that precomputed intersymbol interference estimates q(x,y) are based on a combination of speculative partial intersymbol interference estimates q_{Lx+1} for a first postcursor tap of said channel impulse response L_x+1 and a combination of partial intersymbol interference estimates, q_{Lx+2}, q_{Lx+3},..., q_{Lx+L}, for each subsequent postcursor tap of said channel impulse response, L_x+2, L_x+3,..., L_x+L, wherein at least one of said partial intersymbol interference estimates, q_{Lx+i} (1 <= I <= L), for said subsequent postcursor taps is based on a first past decision from a corresponding state); precomputing branch metrics based on said precomputed intersymbol interference estimates (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence); selecting one of said precomputed branch metrics based on a second past decision from a corresponding state (since q(x,y) depends from second past decisions, precomputed branch metrics are based on a second past decisions); computing a new path metric for a path extension from a corresponding state based on said selected branch metrics (this step is inherently part of Viterbi's algorithm, i.e., path metrics are always calculated from branch metrics); and determining a best survivor path into a state by selecting a path having a best new path metric among said

corresponding computed new path metrics (this step is inherently part of Viterbi's algorithm).

35 U.S.C. 102(e) rejection of claim 2.

Col. 6, lines 20-45 in Mui teach partial intersymbol interference estimates, q_{Lx+i} (1 <= l <= L), equal a channel coefficient, w_i, multiplied by a data symbol value, r_i or υ_i.

35 U.S.C. 102(e) rejection of claim 3.

Figure 17 in Mui teach first or second past decisions from a corresponding state include a survivor symbol (x, y) calculated by ISIC Decoder 1604.

35 U.S.C. 102(e) rejection of claim 4.

Col. 33, lines 65-67 of Mui teach that the circuitry in the Mui patent is directed at computing a single-sided template q(x,y) that accounts for postcursor ISI intersymbol interference for use in computing branch metrics for a Viterbi decoder. Add compare select operations are required by Viterbi's algorithm.

35 U.S.C. 102(e) rejection of claim 5.

By definition, a path metric is an accumulation of said corresponding branch metrics over time.

35 U.S.C. 102(e) rejection of claim 6.

By definition, a best path metric is a path metric with minimum or maximum path metric.

35 U.S.C. 102(e) rejection of claim 7.

Col. 33, lines 65-67 of Mui teach that said reduced-state sequence estimation technique is selected from the group consisting essentially of (i) a decision-feedback sequence estimation technique; (ii) a delayed decision-feedback sequence estimation technique; or (iii) a parallel decision-feedback decoding.

35 U.S.C. 102(e) rejection of claims 12, 15, 17 and 18.

Mui teaches a method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of: precomputing intersymbol interference estimates based on a combination (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence; hence a single-sided template q(x,y) that accounts for postcursor ISI is a precomputed intersymbol interference estimate) of i. speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and ii. a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a

first past decision from a corresponding state (col. 25, lines 35-60 in Mui teach that precomputed intersymbol interference estimates q(x,y) are based on a combination of speculative partial intersymbol interference estimates q_{Lx+1} for a first postcursor tap of said channel impulse response L_x+1 and a combination of partial intersymbol interference estimates, q_{Lx+2}, q_{Lx+3},..., q_{Lx+L}, for each subsequent postcursor tap of said channel impulse response, L_x+2, L_x+3,..., L_x+L, wherein at least one of said partial intersymbol interference estimates, q_{Lx+i} (1 <= I <= L), for said subsequent postcursor taps is based on a first past decision from a corresponding state); selecting one of said precomputed intersymbol interference estimates based on a second past decision from a corresponding state (Selection Block 1404 in Figure 14 of Mui teaches selecting one of said precomputed intersymbol interference estimates q(x,y) based on a second past decision from a corresponding state generated by Precursor Equalizer 1402); computing a branch metric based on said selected precomputed intersymbol interference estimates (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence); computing a new path metric for a path extension from a corresponding state based on said selected branch metrics (this step is inherently part of Viterbi's algorithm, i.e., path metrics are always calculated from branch metrics); and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics (this step is inherently part of Viterbi's algorithm).

35 U.S.C. 102(e) rejection of claim 13.

Figure 17 in Mui teach first or second past decisions from a corresponding state include a survivor symbol (x, y) calculated by ISIC Decoder 1604.

35 U.S.C. 102(e) rejection of claim 14.

Col. 33, lines 65-67 of Mui teach that the circuitry in the Mui patent is directed at computing a single-sided template q(x,y) that accounts for postcursor ISI intersymbol interference for use in computing branch metrics for a Viterbi decoder. Add compare select operations are required by Viterbi's algorithm.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mui; Shou Yee (US 6690739 B1; Note: the effective filing date is 14 January 2000).

35 U.S.C. 103(a) rejection of claim 37.

Mui teaches a method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of: precomputing intersymbol interference estimates based on a combination (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence; hence a single-sided template q(x,y) that accounts for postcursor ISI is a precomputed intersymbol interference estimate) of i. speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and ii. a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state (col. 25, lines 35-60 in Mui teach that precomputed intersymbol interference estimates q(x,y) are based on a combination of speculative partial intersymbol interference estimates q_{Lx+1} for a first postcursor tap of said channel impulse response L_x+1 and a combination of partial intersymbol interference estimates, q_{Lx+2}, $q_{Lx+3}, \ldots$, q_{Lx+L}, for each subsequent postcursor tap of said

channel impulse response, L_x+2, $L_x+3,\ldots$, L_x+L, wherein at least one of said partial intersymbol interference estimates, q_{Lx+i} (1 <= I <= L), for said subsequent postcursor taps is based on a first past decision from a corresponding state); precomputing branch metrics based on said precomputed intersymbol interference estimates (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence); selecting one of said precomputed branch metrics based on a second past decision from a corresponding state (since q(x,y) depends from second past decisions, precomputed branch metrics are based on a second past decisions); computing a new path metric for a path extension from a corresponding state based on said selected branch metrics (this step is inherently part of Viterbi's algorithm, i.e., path metrics are always calculated from branch metrics); and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics (this step is inherently part of Viterbi's algorithm).

However Mui does not explicitly teach the specific use specific circuit components for implementing the method taught in the Mui patent.

The Examiner asserts that it would have been an obvious Engineering Design Choice to use specific circuit components for implementing the method taught in the Mui patent based on circuit design requirements such as available space, available circuitry, cost, feasibility, etc.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Mui by including use specific circuit components for implementing the method taught in the Mui patent. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use specific circuit components for implementing the method taught in the Mui patent would have provided the opportunity for implementing the method taught in the Mui patent based on circuit design requirements such as available space, available circuitry, cost, feasibility, etc.

35 U.S.C. 103(a) rejection of claim 38.

Mui teaches a method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of: precomputing intersymbol interference estimates based on a combination (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence; hence a single-sided template q(x,y) that accounts for postcursor ISI is a precomputed intersymbol interference estimate) of i. speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and ii. a combination of partial intersymbol interference estimates for each subsequent

postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state (col. 25, lines 35-60 in Mui teach that precomputed intersymbol interference estimates q(x,y) are based on a combination of speculative partial intersymbol interference estimates q_{Lx+1} for a first postcursor tap of said channel impulse response L_x+1 and a combination of partial intersymbol interference estimates, q_{Lx+2}, q_{Lx+3},..., q_{Lx+L}, for each subsequent postcursor tap of said channel impulse response, L_x+2, L_x+3,..., L_x+L, wherein at least one of said partial intersymbol interference estimates, q_{Lx+i} (1 <= I <= L), for said subsequent postcursor taps is based on a first past decision from a corresponding state); selecting one of said precomputed intersymbol interference estimates based on a second past decision from a corresponding state (Selection Block 1404 in Figure 14 of Mui teaches selecting one of said precomputed intersymbol interference estimates q(x,y) based on a second past decision from a corresponding state generated by Precursor Equalizer 1402); computing a branch metric based on said selected precomputed intersymbol interference estimates (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence); computing a new path metric for a path extension from a corresponding state based on said selected branch metrics (this step is inherently part of Viterbi's algorithm, i.e., path metrics are always calculated from branch metrics); and determining a best survivor path into a state by

selecting a path having a best new path metric among said corresponding computed new path metrics (this step is inherently part of Viterbi's algorithm).

However Mui does not explicitly teach the specific use specific circuit components for implementing the method taught in the Mui patent.

The Examiner asserts that it would have been an obvious Engineering Design Choice to use specific circuit components for implementing the method taught in the Mui patent based on circuit design requirements such as available space, available circuitry, cost, feasibility, etc.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Mui by including use specific circuit components for implementing the method taught in the Mui patent. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use specific circuit components for implementing the method taught in the Mui patent would have provided the opportunity for implementing the method taught in the Mui patent based on circuit design requirements such as available space, available circuitry, cost, feasibility, etc.

Allowable Subject Matter

9. Claims 9 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The present invention pertains to a method for processing a signal received from a dispersive channel by precomputing intersymbol interference estimates based on speculative partial intersymbol interference estimates and precomputing branch metrics based on said precomputed intersymbol interference estimates.

Claim 9 recites various features:

"wherein said steps of precomputing and selecting branch metrics comprise the steps of: precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates; selecting one of said precomputed one-dimensional branch metric based on a past decision from a corresponding state; and combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric".

The Prior Art of record and, in particular Mui, teach a method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of: precomputing intersymbol interference estimates based on a combination (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence; hence a single-sided template q(x,y) that accounts for postcursor ISI is a precomputed intersymbol interference estimate) of i. speculative partial intersymbol interference estimates for a first postcursor tap of said channel

impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and ii. a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state (col. 25, lines 35-60 in Mui teach that precomputed intersymbol interference estimates q(x,y) are based on a combination of speculative partial intersymbol interference estimates q_{Lx+1} for a first postcursor tap of said channel impulse response L_x+1 and a combination of partial intersymbol interference estimates, $q_{Lx+2}, q_{Lx+3}, \ldots, q_{Lx+L}$, for each subsequent postcursor tap of said channel impulse response, L_x+2, $L_x+3, \ldots, L_x+L$, wherein at least one of said partial intersymbol interference estimates, q_{Lx+i} (1 <= I <= L), for said subsequent postcursor taps is based on a first past decision from a corresponding state); precomputing branch metrics based on said precomputed intersymbol interference estimates (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence); selecting one of said precomputed branch metrics based on a second past decision from a corresponding state (since q(x,y) depends from second past decisions, precomputed branch metrics are based on a second past decisions); computing a new path metric for a path extension from a corresponding state based on said selected branch metrics (this step is inherently part of Viterbi's algorithm, i.e., path metrics are always calculated from branch metrics); and determining a best survivor path into a

state by selecting a path having a best new path metric among said corresponding computed new path metrics (this step is inherently part of Viterbi's algorithm). The prior art however are not concerned with and do not teach precomputing and selecting branch metrics by "precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates; selecting one of said precomputed one-dimensional branch metric based on a past decision from a corresponding state; and combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric" as taught by claim 9 and its base and intervening claims. Hence the prior art taken alone or in any combination fail to teach the claimed novel feature in claim 9 in view of its base and intervening claims.

Claim 16 recites various features:

"wherein said steps of precomputing and selecting branch metrics comprise the steps of: precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates; selecting one of said precomputed one-dimensional branch metric based on a past decision from a corresponding state; and combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric". The Prior Art of record and, in particular Mui, teach a method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of: precomputing intersymbol interference estimates based on a combination (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each

current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence; hence a single-sided template q(x,y) that accounts for postcursor ISI is a precomputed intersymbol interference estimate) of i. speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and ii. a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state (col. 25, lines 35-60 in Mui teach that precomputed intersymbol interference estimates q(x,y) are based on a combination of speculative partial intersymbol interference estimates q_{Lx+1} for a first postcursor tap of said channel impulse response L_x+1 and a combination of partial intersymbol interference estimates, q_{Lx+2}, q_{Lx+3},..., q_{Lx+L}, for each subsequent postcursor tap of said channel impulse response, L_x+2, L_x+3,..., L_x+L, wherein at least one of said partial intersymbol interference estimates, q_{Lx+i} (1 <= I <= L), for said subsequent postcursor taps is based on a first past decision from a corresponding state); selecting one of said precomputed intersymbol interference estimates based on a second past decision from a corresponding state (Selection Block 1404 in Figure 14 of Mui teaches selecting one of said precomputed intersymbol interference estimates q(x,y) based on a second past decision from a corresponding state generated by Precursor Equalizer 1402); computing a branch metric based on said selected precomputed intersymbol

interference estimates (the Abstract in Mui teaches an ISIC decoder for computing branch metrics for each current branch based on a single-sided template q(x,y) that accounts for postcursor ISI in a partially equalized sequence); computing a new path metric for a path extension from a corresponding state based on said selected branch metrics (this step is inherently part of Viterbi's algorithm, i.e., path metrics are always calculated from branch metrics); and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics (this step is inherently part of Viterbi's algorithm).

The prior art however are not concerned with and do not teach precomputing and selecting branch metrics by "precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates; selecting one of said precomputed one-dimensional branch metric based on a past decision from a corresponding state; and combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric" as taught by claim 16 and its base and intervening claims. Hence the prior art taken alone or in any combination fail to teach the claimed novel feature in claim 16 in view of its base and intervening claims.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Bergmans; Johannes W. M. et al. (US 5291523 A) teach a data receiver comprising deriving means for deriving a detection signal from an input signal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (703) 308-7066. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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